Guidelines for Replacing Asbestos Cement Pipe by Close Tolerance Pipe Slurrification (CTPS)

INTRODUCTION

There are over 630,000 miles of Asbestos Cement pipe buried across the United States that have reached or will reach the end of their estimated design and useful lives. Like most of our buried infrastructure, the time has come to renovate or replace these systems. Of course, the issue is how to most efficiently and economically accomplish the work with the least disruption to the public, as necessary. Removing and replacing Asbestos Cement pipe has the additional burdens of complying with NESHAP and OSHA requirements which govern the handling, removal, and disposal of any material containing asbestos.

The EPA recently reviewed a request for an alternative work practice (AWP) called Close Tolerance Pipe Slurrification (CTPS) to replace, rehabilitate, and repair existing buried Asbestos Cement (AC) pipe systems. Subsequently, the EPA has determined that Close Tolerance Pipe Slurrification (CTPS) is an equivalent work practice to open cut pipe replacement for replacing, rehabilitating, and repairing Asbestos Cement (AC) pipe.

Close Tolerance Pipe Slurrification (CTPS) is a proven "Trenchless Technology" method used to remove and replace an existing pipe line with minimum amounts of excavation. The CTPS method removes the existing pipe by pulling a rotating reamer through the existing pipe while simultaneously injecting a bentonite-based lubricating fluid. The reamer rotates at sufficient speed to grind the existing pipe, surrounding soil, and bentonite-based lubricating fluid into a slurry. This slurry is squeegeed out of the ground into a receiving pit by the new pipe that is pulled in behind the reamer. After completion of the CTPS process, the existing pipe is removed, the new pipe is installed through the subsequent tight-fitting void, and the slurry containing the existing pipe fragments, soil, and bentonite-fluid is removed from the ground.

When the patented CTPS process is used to remove and replace Asbestos Cement pipe systems, there are several important components of the process that work extremely well with regulations surrounding AC pipe work. First, the patented process requires the injection of bentonite-based fluid at critical points. This fluid maintains a wet-cutting environment, which is an important requirement for cutting Asbestos Containing Material (ACM). Second, the "Close Tolerance" sizing of the reamer, in relation to the new pipe being pulled into place, facilitates the removal of the Asbestos Containing Material (ACM) from the ground. This "Close Tolerance" sizing creates a scenario where the new product pipe, along with the injection of additional drill fluid, will pressurize the slurry, which is expelled at strategically placed pressure relief holes. The slurry containing the ACM is then removed from the site. Third, any remaining trace amounts of asbestos fiber are encapsulated in the skim coat of slurry remaining around

the pipe. This skim coat has the consistency of a light-weight concrete material commonly known as “excavatable flowable fill”.

Applying the CTPS technology to the removal and replacement of Asbestos Cement pipe systems has the potential for several advantages over the alternatives currently available to the municipalities and utility owners charged with replacing AC pipe systems at the end of their design and useful life cycles. The primary methods currently being implemented for replacing AC pipe systems are “open cut” replacement in the same ditch or “open cut” replace in a new trench location.

Advantages of replacing pipe by CTPS over the alternatives are;

- CTPS removes the Asbestos Cement fibers from the site and disposes of them at a certified landfill leaving any trace amounts left in the ground encapsulated in the slurry
- CTPS is a “Trenchless Technology” potentially allowing for significant cost savings associated with restoration from excavating roads, driveways, sidewalks, lawns, and landscaping when compared to “open cut” (trench) methods
- CTPS is a “Trenchless Technology” potentially allowing pipe AC Pipe to be replaced with less disruption to residents, businesses, and traffic patterns.
- CTPS uses the existing pipe location, therefore, new easements are not required
- CTPS uses the existing pipe location, therefore, existing AC Pipe is not abandoned in place

THE PURPOSE OF THIS MANUAL

The purpose of this manual is to provide a guideline for compliance with the EPA’s approved Alternative Work Practice (AWP) so that the CTPS process is properly used to remove and replace Asbestos Cement pipe. In order to comply with the AWP, one must understand the components and important principles of the patented CTPS process, pertinent NESHAP requirements, and pertinent OSHA Requirements.

After explaining the CTPS process, pertinent NESHAP requirements, and pertinent OSHA Requirements, the Alternative Work Practice (AWP) for Using Close Tolerance Pipe Slurrification (CTPS) to Replace AC Pipe will be outlined for implementation purposes. The tasks will be broken down into pre-project activities, site-preparation, and construction activities. Variance from the combination of “Close Tolerance” and “Pipe Slurrification” process in any way will significantly diminish the ability of meeting the intent of the approved Alternative Work Practice (AWP) for removing Asbestos Cement Pipe.

CLOSE TOLERANCE PIPE SLURRIFICATION (CTPS) PROCESS IN GENERAL

Close Tolerance Pipe Slurrification (CTPS) is a proven “Trenchless Technology” method used to remove and replace an existing pipe line with minimum amounts of excavation. The CTPS method removes the existing pipe by pulling a rotating reamer through the existing pipe while simultaneously injecting a bentonite-based lubricating fluid. The reamer rotates at sufficient speed (220 RPM’s minimum) to grind the existing pipe, surrounding soil, and bentonite-based

lubricating fluid into a slurry. This slurry is squeegeed out of the ground into a receiving pit by the new pipe that is pulled in behind the reamer. After completion of the CTPS process, the existing pipe is removed, the new pipe is installed through the subsequent tight-fitting void, and the slurry containing the existing pipe fragments, soil, and bentonite-fluid is removed from the ground.

The CTPS process starts with two excavations at either end of a pipe segment to be removed and replaced. The horizontal directional drill (HDD) rig sits at the machine pit where the existing pipe line is used as a pilot hole. The horizontal directional drilling (HDD) rods are pushed through the existing pipe from this excavation to another where the reamer and pipe are attached and pulled into place. The reamer is held centered in the existing pipe by a guide head so that the reamer cuts uniformly over the existing pipe. Thus, the CTPS process will keep the alignment and grade of the existing pipe line. CTPS does not displace the existing pipe fragments into the surrounding soil, but rather cuts the soil ¼" more than the outside diameter of the new pipe being installed and then blends the soil and existing pipe fragments into a slurry that is squeegeed out by the new pipe being pulled into place. The slurry (consisting of the soil and pipe fragments) is pushed or squeegeed to access points in front of the pipe being installed where it is removed by a vacuum excavator and hauled to a landfill.

Bentonite-Based Drill Fluid is the Key to "Pipe Slurrification"

The patented process requires the continuous injection of a bentonite-based fluid at critical points throughout the duration of the process. This drill fluid serves several important functions in the CTPS process.

First, the drill fluid's lubricating properties are key to mixing the existing pipe and soil into a slurry when the reamer is rotated at sufficient speed; much like a blender would mix cake batter and water to create a semi-liquid slurry. The "blending' of the existing pipe material, soil and drill fluid is the essence of the "Pipe Slurrification" process.

Second, the drill fluid is injected into the existing pipe line with sufficient quantity to flood the existing pipe and soil on both sides of the reamer so that the reamer is submerged in the drilling fluid while cutting and grinding the existing pipe. The continuous injection of drill fluid to submerge the reamer maintains a wet-cutting environment. This is an important requirement for cutting Asbestos Containing Material (ACM).

Third, the drill fluid (turned slurry) captures the soil and pipe fragments in a semi-liquid state. In this state, the soil and pipe fragments can be transported and removed (squeegeed) from the tight-fitting void/opening when the new pipe is pulled into place. Once the slurry is squeegeed out into the excavations, it can be easily vacuumed into container trucks for disposal at the landfill.

Fourth, the drill fluid (turned slurry) lubricates the tight-fitting void or opening so that the new pipe can be pulled through the void from one excavation to the other. This lubrication keeps the new pipe from becoming stuck in the tight-fitting void due to surface friction.

Finally, the "Pipe Slurrification" process grinds and reactivates the cementitious properties of the Asbestos Cement pipe; whereas these cementitious particles combine with the slurry to harden into a material with the consistency of a light-weight concrete material commonly known as "excavatable flowable fill". This material fills the ¼" annular space between the new pipe and virgin soil, forming what has been described as a skim coat around the new pipe. Consequently, any remaining trace amounts of asbestos fiber not removed are encapsulated in this skim coat of slurry remaining around the pipe. Again, this skim coat has the consistency of a light-weight concrete material commonly known as "excavatable flowable fill".

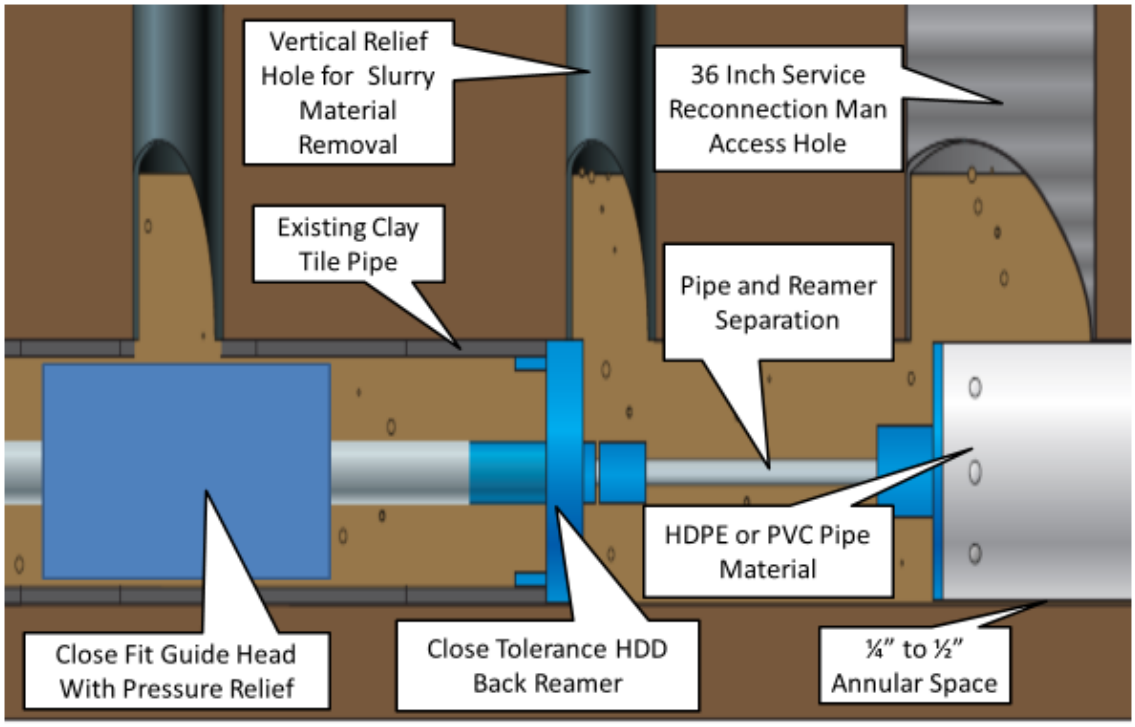
"Close Tolerance" is the Key to Removing Asbestos Containing Material from the Ground

The term "Close Tolerance" refers to the fact that the reamer is sized only ¼" larger than the outside diameter of the new pipe that will be installed behind the reamer. Consequently, the reamer creates a tight-fitting cavity or void only slightly larger than the new pipe being pulled into place. This "Close Tolerance" of ¼" is critical so that the pulling head that attaches the new pipe to the reamer will squeegee the slurry that contains the soil, pipe fragments, drill fluid out of the tight-fitting void while it is pulled through. This "Close Tolerance" sizing creates a scenario where the new product pipe, along with the injection of additional drill fluid, will pressurize the slurry, which is expelled at strategically placed pressure relief holes. It is from these vertical relief holes that the slurry containing the ACM is vacuum excavated and properly removed from the site.

Vertical Pressure Relief Holes or Excavations

As described, the injection of bentonite-based drill fluid, "Pipe Slurrification, and "Close Tolerance" sizing of the reamer creates a scenario where the slurry becomes pressurized when the new pipe is pulled into place. This pressure facilitates the eventual removal of the slurry at strategically located "Vertical Pressure Relief Holes" or excavations. Often, these relief holes are excavations that would have occurred naturally at service reconnections. However, in some instances, "Vertical Pressure Relief Holes" must be installed for the sole purpose of pressure relief. In these instances, the relief holes serve the purpose of controlled pressure relief to keep the slurry from escaping at an undesired location.

Close Tolerance Pipe Replacement Process



Please note that "Close Tolerance" differentiates from traditional HDD practices where the reamer is sized to 1.5 times larger than the outside diameter of the new pipe to be installed; for example, a 12" void would be created to pull in an 8" pipe. Consequently, the larger void of traditional HDD allows the new pipe being pulled in place to float through the slurry rather than squeegee the material into an excavation where it can be removed from the site. Thus, with the traditional HDD method the bulk of the slurry is not removed from the underground cavity.

Variance from the combination of "Close Tolerance" and "Pipe Slurrification" process in any way will significantly diminish the ability of meeting the intent of the approved Alternative Work Practice (AWP) for Using CTPS for Removing Asbestos Cement Pipe.

REGULATIONS PERTINANT TO THE REMOVAL AND REPLACEMENT OF ASBESTOS CEMENT PIPE

To date, two federal agencies have been principally responsible for generating regulations for asbestos control; the U.S Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA). The EPA regulates asbestos through the National Emissions Standards for Hazardous Air Pollutants (NESHAP)

To comply with the Alternative Work Practice (AWP) for Using Close Tolerance Pipe Slurrification (CTPS) to Replace AC Pipe, one must understand the pertinent NESHAP and OSHA regulations that effect and govern the removal and replacement of AC pipe. While the EPA regulations are generally concerned with notification, air quality, and disposal requirements that effect the

long-term impact of asbestos fibers on the public and the environment, OSHA regulations are generally related to the immediate and long-term safety of the employees working with and around asbestos containing material.

APPLICABLE NESHAP REQUIREMENTS/CONCEPTS

Asbestos Containing Material (ACM) = any material containing more than 1% asbestos

Category II Nonfriable ACM = any material that does not include asbestos containing packaging, gaskets, resilient floor coverings, or asphalt roofing products that contains more than 1% asbestos, that, when dry cannot be crumbled, pulverized or reduced to powder by hand pressure.

Friable Asbestos Material = any material containing more than 1% asbestos (ACM) that, when dry can be crumbled, pulverized, or reduced to powder by hand pressure.

Regulated Asbestos Containing Material (RACM) = Category II Nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by forces expected to act on the material in the course of demolition or renovation operations. Removing and replacing AC pipe by excavation in the same trench and by "Trenchless Technology" methods is generally considered to be RACM.

NESHAP also states that there must be more than 260 LF of pipe involved in renovation or demolition for ACM to be considered Regulated ACM. Any material or situation not falling under the definition of Regulated Asbestos Containing Material (RACM) is conversely, not regulated by the EPA. However, OSHA standards for worker protection still apply, so all of the employee protections required by OSHA must be followed.

Asbestos Cement Pipe does not become Regulated Asbestos Containing Material (RACM) until renovation, repairs, and replacement efforts begin; as these efforts would require grinding, cutting, abrading, crumbling, and crushing the AC Pipe. These are the issues that create the potential exposure, according to NESAHP and OSHA. As mentioned above, it is also important to note that renovations of less than 260 LF (over a 1-year period) are not regulated by NESHAP but are regulated by OSHA. Consequently, AC Pipe system owners are allowed to make small repairs on their systems without having to meet all the requirements of NESHAP or being considered RACM but still have to protect their workers according to OSHA standards.

Unless there will be less than the 260 LF that triggers the exemption, removing and replacing AC pipe will be considered RACM which triggers the following requirements of NESHAP/EPA.

Training and Certification

There are several training and subsequent certifications approved and required by the EPA regarding working with asbestos and complying with NESHAP. Typically, only the Asbestos Worker certification and the Asbestos Supervisor certification are required of the crew working

at the site. The Management Planner, Inspector, and Project Designer certifications relate more to the pre-construction activities.

The **Asbestos Worker** certification is a four-day course required for anyone involved in the active removal and disposal of Asbestos Containing Material (ACM). A one-day annual refresher course must be taken to maintain the certification.

The **Asbestos Supervisor** certification is a five-day course required for anyone involved in the supervision of the removal and disposal of Asbestos Containing Material (ACM). A one-day annual refresher course must be taken to maintain the certification.

The **Asbestos Management Planner** certification is a two-day course (In Addition to the Asbestos Inspector Course) required for any anyone involved in developing a management plan for the active removal and disposal of Asbestos Containing Material (ACM). This is typically required for work pertaining to schools. A one-day annual refresher course must be taken to maintain the certification.

The **Asbestos Inspector** certification is a three-day course required for any anyone involved in inspecting the site that would potentially involve the active removal and disposal of Asbestos Containing Material (ACM). A one-day annual refresher course must be taken to maintain the certification.

The **Asbestos Project Designer** certification is a three-day course required for any anyone involved in designing and developing specifications for projects that involve the active removal and disposal of Asbestos Containing Material (ACM). A one-day annual refresher course must be taken to maintain the certification.

Notification Requirement – NESHAP 61.145

If it is determined that NESHAP (RACM) regulations will apply to any particular Asbestos Pipe renovation project, there are notification requirements. EPA must be notified in writing 10 days in advance of construction activities, except in the event of emergencies.

No Visible Emissions (VE) – NESHAP 61.145 & 61.150

The most imperative regulation for removing and replacing AC pipe is the No Visible Emission (VE) rule. Under no circumstances shall Visible Emissions (VE) be released into the atmosphere while performing AC pipe removal. Visible Emissions are dust clouds containing AC fibers that can be seen with the naked eye while cutting, grinding, breaking or removing Asbestos Containing Material (ACM). Visible Emissions are avoided by choosing engineered control methods that do not create dust or controlled with spraying amended water over the work area.

Once construction begins, NESHAP requires that no visible emission to the outside air be allowed during the collection, processing, packaging, or transporting of any Asbestos Containing Material (ACM). Unless a written waiver from the EPA is received, it is required that all material

be kept wet before and during removal, as well as while being containerized, transported, and disposed. The positive effects of wet removal can be enhanced by adding a wetting agent or surfactant to the water. This is called amended water. ACM should be kept wet by a low-pressure water system. NESHAP outlines methods of emission control, as follows.

Adequately wet ACM by

- Mix control device asbestos waste to form a slurry; adequately wet other asbestos containing waste material. and
- Discharge no visible emissions to the outside air from collection, mixing, wetting, and handling operations, and
- After wetting, seal all ACM waste in leak-tight containers while wet; or for materials that will not fit into containers without additional breaking, put materials into leak-tight wrapping, and
- Properly label containers as containing Asbestos Containing Material, and
- Properly label containers with the name of the waste generator and the location from which the waste was generated

Disposal

NESHAP also requires that all Asbestos Containing Material waste be disposed of at one of the following facilities.

- A waste disposal site operated in accordance with the provisions of NESHAP regulation Section 61.154 – Standard for Active Waste Disposal Sites.
    - Unless there is a natural barrier that adequately deters access by the general public, install and maintain warning at all entrances and at intervals of 330 LF or less along all property lines.
- A waste disposal site operated in accordance with the provisions of NESHAP regulation Section 61.155 – Standard for Operations that Convert ACM waste into Non-Asbestos Material.

Waste Shipment Records (WSR) must be maintained for a period of two years by the generator. The WSR must include the following information;

- Name, address, and telephone number of the waste generator;
- Name and address of the local, state, or EPA regional agency responsible for administering the asbestos NESHAP program;

- The quantity of asbestos containing waste material in cubic yards or cubic meters;
- The name and telephone of the disposal site operator;
- Name and physical site location of the disposal site;
- Date transported;
- Name, address, and telephone number of transporter(s)
- Certification that the waste was properly classified, packed, marked, labeled, and transported.

Deed Notation

Finally, NESHAP requires that once an Active Waste Disposal Site has become Inactive, a notation to the deed of the property (or any other instrument that would normally be examined during a title search) must be made within 60 days. This notation would notify any potential purchaser of the property that the land has been used for the disposal of Asbestos Containing Material (ACM) waste, the amount and location of the waste disposal, and that the site is subject to 40 CFR part 61, subpart M.

APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS/REQUIREMENTS

OSHA standards cover all private-sector employers and employees in the 50 states and all territories under federal jurisdiction. In almost all cases, OSHA standards are a major regulatory requirement when removing and replacing AC pipe. While the EPA regulations are generally concerned with notification, air quality, and disposal requirements that effect the long-term impact of asbestos fibers on the public and the environment, OSHA regulations are generally related to the immediate and long-term safety of the employees working with and around asbestos containing material.

OSHA's Construction Industry Standard 29 CFR 1926.1101 specifically covers the work related to removing and replacing AC pipe. This standard would be in addition to other standards that govern excavation and trenching and other applicable OSHA standards related to the construction of an underground pipe line. Highlights from the asbestos standard are as follows;

Exposure Levels

- Permissible Exposure Limit (PEL) = .01 fibers per cubic centimeter (f/cc); Time Weighted Average (TWA). TWA means an exposure concentration averaged over an 8-hour period.
- Excursion Limit (EL) = 1.0 f/cc as averaged over a sampling period of 30 minutes.

Asbestos Containing Material (ACM) = any material containing more than 1% asbestos

Removing and Replacing AC pipe would be categorized by OSHA as **Class II** – Asbestos work activities involving the removal of ACM, which is not TSI or surfacing material.

Competent Person = one who is capable of identifying existing asbestos hazards in the workplace, capable of selecting the appropriate control strategy, and having the authority to take prompt corrective measures. Personnel must be trained by to meet the criteria of EPA Model Accreditation Plan for Contractors/Supervisor/Workers for Class II work.

Negative Exposure Assessment (NEA) = a demonstration by an employer that an employee's exposure during an operation is expected to be consistently below the Permissible Exposure Limit (PEL) and the Excursion Limit (EL). If the employer can demonstrate that employee exposures are below the PEL or EL by any of the following means, this is deemed a Negative Exposure Assessment (NEA):

- Objective Data, or
- Personal Air Sampling results collected from the previous 12 months, or
- Initial Monitoring of the current project

Initial Monitoring = an assessment of airborne concentrations of asbestos prior to the initiation of work activities conducted by a competent person.

Periodic Monitoring = periodic air monitoring is required to be conducted daily within the regulated area for Class II work, unless;

- A Negative Exposure Assessment has been made, or
- All employees in a regulated area are wearing supplied air respirators operated in the pressure demand mode, or other positive pressure mode respirator.

Regulated Area – is an area established by the employer where Class II asbestos work is being conducted, and any adjoining area where debris and waste accumulate. Only authorized personnel may enter regulated areas. The following requirements apply to a regulated area;

- Mark the area to minimize the number of persons within the regulated area and to protect person outside the area;
- Limit access to authorized personnel only;
- Prohibit eating, drinking, smoking, chewing, and the application of cosmetics in the regulated area;
- Competent Person must supervise work within the regulated area.

Warning signs must be displayed and posted at all approaches to regulated areas. The sign must bear the following information;

DANGER
ASBESTOS
MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

Warning labels must be affixed to all asbestos waste containers. The label must include the following information;

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

Class II Methods of Compliance for Removing and Replacing Buried AC Pipe

To the extent feasible, engineering and work practice controls must be used to reduce employee exposure to below the PEL and/or EL. Regardless of exposure levels the following control methods must be used for all Class II activities.

- HEPA vacuums to collect debris and dust;
- Wet methods for removing, containerizing, and transporting ACM;
- Prompt clean-up and disposal of waste and debris;
- Competent Person supervision;
- Employees must be trained and use work practices/controls specifically outlined in the standard.

A Negative Exposure Assessment alleviates the need for the following additional requirements for Class II work;

- Requiring the use of protective clothing such as coveralls or similar full-body clothing, head coverings, gloves, and foot coverings.
- Hygiene facility adjacent to regulated work area for exiting and entrance.
- Cleaning equipment, containers, and clothing prior to removal from the equipment room.

Medical Surveillance Program (MSP)

The employer must establish a medical surveillance program, prior to assignment, for all employees who 1) will be required to wear negative-pressure respirators, 2) will be engaged in Class II work for 30 days or more per year, or 3) will be exposed to airborne concentrations of asbestos at or above the Permissible Exposure Level (PEL) and/or Excursion Limit (EL) for more than 30 days per year (or a combination of 2 and 3).

The MSP involves examinations performed or supervised by a licensed physician and shall be provided without cost to the employee. The examinations must include;

- A medical and work history;
- A physical examination with special emphasis directed to the respiratory, cardiovascular, and gastrointestinal systems;
- Completion of a respiratory disease questionnaire;
- A pulmonary function test.
- Must be provided to the employee within 30 days

Record Keeping

Employers must maintain the following records for a Class II Asbestos Project;

- Accurate records of all measurements taken to monitor employee exposure to asbestos. These records must be kept for 30 years.
- An accurate record for each employee subject to medical surveillance. This record must be maintained for the duration of employment plus 30 years.
- Employee training records. This record must be maintained for 1 year beyond the last date of employment.

OTHER FEDERAL, STATE, & LOCAL REQUIREMENTS

Applicable Department of Transportation (DOT) Requirements

The DOT requires that anyone who transports Hazardous Material, which includes asbestos, have the HAZMAT DOT endorsement. Also, this person should be trained in asbestos with the 2-hour Asbestos Awareness class.

Applicable State and Local Requirements

There is potential for additional State and Local requirements for working with AC pipe beyond the outlined federal regulations. Please check with the local authorities regarding these requirements.

GUIDELINE FOR COMPLIANCE WITH THE ALTERNATIVE WORK PRACTICE (AWP) FOR THE USE OF CTPS TO REPLACE ASBESTOS CEMENT PIPE

When used to remove and replace an existing Asbestos Cement pipe, the primary benefit of using the CTPS method is capturing the Asbestos Cement pipe fragments and fibers in the slurry for eventual removal from the site. Since the bulk of the AC pipe and AC fibers are removed from the site after the CTPS process, the EPA considers the subsequent site equivalent to the condition that would be left after open cut replacement. This is the primary basis for EPA approval of the CTPS Alternative Work Practice (AWP).

Since the purpose of this manual is to provide a guideline for compliance with the approved Alternative Work Practice (AWP) so that the CTPS method is properly used to remove and replace Asbestos Cement pipe, the CTPS process will be outlined in detail from start to finish with reference to the pertinent NESHAP regulations that apply.

Pre-Construction Activities

Training and Certifications

As previously discussed, Asbestos Cement Pipe does not become Regulated Asbestos Containing Material (RACM) until renovation, repairs, and replacement efforts begin; as these efforts would require grinding, cutting, abrading, crumbling, and crushing the AC Pipe. These are the tasks that create the potential exposure, according to NESAHP and OSHA. As mentioned above, it is also important to note that renovations of less than 260 LF (over a 1-year period) are not regulated by NESHAP but are regulated by OSHA. Consequently, AC Pipe system owners are allowed to make small repairs on their systems without having to meet all the requirements of NESHAP or being considered RACM but still have to protect their workers according to OSHA standards.

As discussed, there are several training and subsequent certifications approved and required by the EPA regarding working with asbestos and complying with NESHAP. Typically, only the Asbestos Worker certification and the Asbestos Supervisor certification are required of the crew working at the site by the EPA. Also, many states require additional training and certifications. Additionally, many states require that the company performing the work be certified or registered as an asbestos abatement contractor. It is imperative that the proper training, certifications, registrations, and licenses be acquired prior to the start of the project.

OSHA's also requires a Competent Person to be capable of identifying existing asbestos hazards in the workplace, capable of selecting the appropriate control strategy, and having the authority to take prompt corrective measures. The knowledge requirement can be demonstrated by the Asbestos Supervisor certification. Additionally, OSHA requires a Competent Person who is knowledgeable and has authority regarding excavation, and general construction.

Medical Surveillance Program

The employer must establish a medical surveillance program, <u>prior to assignment</u>, for all employees who 1) will be required to wear negative-pressure respirators, 2) will be engaged in Class II work for 30 days or more per year, or 3) will be exposed to airborne concentrations of asbestos at or above the Permissible Exposure Level (PEL) and/or Excursion Limit (EL) for more than 30 days per year (or a combination of 2 and 3). Please see the details of a proper Medical Surveillance Program, previously discussed.

Notification Requirement – NESHAP 61.145

If it is determined that NESHAP (RACM) regulations will apply, there are notification requirements. EPA must be notified in writing 10 days in advance of construction activities,

except in the event of emergencies. Typically, this notification is made to the EPA and/or the state entity with jurisdiction.

Initial Monitoring/Exposure Assessment & Negative Exposure Assessments

OSHA requires that an initial assessment of airborne concentrations of asbestos be made prior to the initiation of any work activities. A Negative Exposure Assessment (NEA) is demonstration by an employer that an employee's exposure during an operation is expected to be consistently below the Permissible Exposure Limit (PEL) and the Excursion Limit (EL). The demonstration can be accomplished by one of the following three means;

- Objective Data, or
- Personal Air Sampling results collected from the previous 12 months, or
- Initial Monitoring of the current project

Demonstration of a successful Negative Exposure Assessment (NEA) eliminates the need for;

- Periodic Monitoring
- Requiring the use of protective clothing such as coveralls or similar full-body clothing, head coverings, gloves, and foot coverings.
- Hygiene facility adjacent to regulated work area for exiting and entrance.
- Cleaning equipment, containers, and clothing prior to removal from the equipment room.

Summary of Pre-Construction Activities

1. Training
    a. Asbestos Work Certifications (EPA)
    b. Asbestos Supervisor Certifications (EPA)
    c. Competent Person (OSHA)
2. Medical Surveillance Program (OSHA)
3. Notification of EPA – 10 Days in Advance In Writing (EPA)
4. Initial Monitoring/Negative Exposure Assessment (OSHA)

Site Preparation

After all the Pre-construction Activities are complete, it is time to prepare the site for AC Pipe removal and replacement construction activities. Preparing the site consists of the following necessary activities;

- Establish a **Regulated Work Area** (RWA) using barricade, safety, or asbestos tape. Remember, an RWA is an area established by the employer where Class II asbestos work is being conducted, and any adjoining area where debris and waste accumulate. Only authorized personnel may enter regulated areas. The following requirements apply to a regulated area;

- Mark the area to minimize the number of persons with the regulated area and to protect person outside the area;
- Limit access to authorized personnel only;
- Prohibit eating, drinking, smoking, chewing, and the application of cosmetics in the regulated area;
- Competent Person must supervise work within the regulated area.

- Post the proper Asbestos Warning signs at all approaches

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

- Establish a waste load out area attached to the RWA

Excavation and Pipe Removal Activities

Once the site is properly prepared, a short section of 15' to 25' of the AC pipe must be excavated and properly removed at both ends of the segment to be replaced by CTPS to allow access for the equipment. Excavation and pipe removal activities consist of the following tasks;

- Machine excavate to expose the AC Pipe
- Hand or vacuum excavate the material around the AC Pipe, so as not to damage the pipe prior to executing proper cutting and removing techniques
- Wet the AC pipe prior to cutting and continuously until cutting operations are completed (spraying with low pressure amended water is recommended)
- Cut the AC pipe with techniques that do not allow the material to become air borne (a snap cutter. soil-pipe cutter, or equal are recommended)
- Remove the pipe sections from the trench in an in-tact condition, while wet
- Wet and containerize the waste material in 6mm poly bags or sheeting
- Seal bags or sheeting
- Properly label waste disposal bags/sheeting

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- Temporarily stockpile waste material in designated load out area (typically a large dumpster that has been previously lined with 6mm poly sheeting)

- Properly, complete Waste Shipment Record (WSR) prior to transporting
- Eventually, dispose of AC waste material at a landfill certified to receive ACM

Summary of Site Preparation Activities

1. Establish Regulated Area (OSHA)
2. Post Proper Warning Signage (OSHA)
3. Excavation and Pipe Removal
    a. Properly Bag ACM Waste (EPA)
    b. Properly label Bags (EPA)
4. Temporarily Store Bagged & Tagged Pipe in Regulated Area (EPA)
5. Disposal of Bagged and Tagged AC Pipe at Landfill (EPA)

Construction Activities

After each end of the existing Asbestos Cement Pipe (to be replaced) is excavated to allow access for the Horizontal Directional Drilling (HDD) Rig, these ends are used as a pilot hole; allowing the HDD drill stem (rod) to be pushed from the HDD drill rig through the existing AC Pipe from one excavation to the other excavation. Lengths between excavations will typically range anywhere from 100' to 1000'. Crews will endeavor to install the maximum amount of pipe possible with the least amount of excavation for maximum efficiency.

Once the drill stem has been strung through the existing AC Pipe, it is attached to the Reaming Train and New Product Pipe. Bentonite-based drill fluid is pumped through the drill stem to the Reamer where the Reamer makes contact with the existing AC Pipe. The Drill Stem/Rod is rotated sufficiently (RPM) to cut and grind the soil, AC Pipe, and drill fluid into a slurry when pulled back through the existing AC Pipe.

The New Product Pipe is simultaneously pulled through the void left by cutting and grinding the AC Pipe and soil into the slurry. The slurry containing the Soil, AC Pipe, and Drilling Fluid is squeegeed forward into the excavations or relief holes where it is removed (sucked out) by Vacuum Excavation equipment. The slurry is subsequently transported and disposed of at a permitted landfill.

The Close Tolerance pipe Slurrification Process consists of the following tasks;

1. Push Drill Stem/Rod Through AC Pipe from One Excavation to the Other excavation
    a. Drill Stem/Rod are 20' Long Steal Tubes
    b. Each Drill Stem/Rod is Threaded to the Next Rod Until the Desired Length Are Pushed Through the Existing AC Pipe to the Other End of the Existing AC Pipe to be replaced
    c. The Drill Stem/Rod is Hollow to Allow Pumping Bentonite-Based Drill Fluid to the (Back) Reamer

2. The Drill Stem/Rod is Attached to the Reaming Train
    a. The Reaming Train Consists of the Guide Head & Back Reamer
        i. The Guide Head Holds the Drill Stem and Back Reamer Centered in the Existing AC Pipe
        ii. The (Back) Reamer is Sized only ¼" Larger than the Outside Diameter of the New Product Pipe to be Installed
        iii. The (Back) Reamer Expels Drill Fluid Into/On to the AC Pipe to Facilitate Wet Cutting
        iv. The Back Reamer or Reamer is Eventually Rotated (Minimum 220 RPM's) and Pulled Back Through the Existing AC Pipe to Mix AC Pipe and Soil Into Slurry

Guide Head & Back Reamer

3. A cable is used to connect the Reamer to the New Product Pipe that will be pulled into the tight-fitting void created by the reamer cutting away the existing AC pipe and soil.
    a. The cable bolts to the Reamer and attaches to the New Product Pipe with a Pipe Pull Head.
        i. Pipe Pull Head
        ii. Attached to New Product Pipe
            1. Pulls New Pipe Into Void Created By Back Reamer
        iii. Drill Fluid Lubricates the New Pipe as it is Pulled Through Newly Cut Hole
        iv. New Product Pipe with Pull Head Attached
        v. New Pipe That is Replacing AC Pipe
            1. Typically – HDPE or PVC
        vi. The Pull Head with New Product Pipe Pushes or Squeegees Slurry (Consisting of AC Pipe, Soil, & Drill Fluid) Forward Into Excavations or Relief Holes

4. Mix Bentonite- Based Fluid to be Used for Pipe Slurrification
    a. Drilling Fluids Required per 1000 Gallon Tank
        i. Soda Ash at 5 Pounds
        ii. Bore Gel (or Equal) at 300 Pounds
        iii. No Sag (or Equal) at 6 Pounds
        iv. Quick Trol (or Equal at 8 Pounds
        v. Portland Cement (or Equal Encapsulant) at 94 Pounds
5. Bentonite-Based Drill Fluid is Pumped Through the Drill Stem/Rod to the Reamer for Wet Cutting
    a. The Drill Stem/Rod is Hollow; Allowing Drill Fluid To Be Pumped Through the Rod to Reamer where the Fluid is Mixed with the AC Pipe and Soil to Create the Slurry
6. The Drill Stem/Rod is Rotated with Sufficient Force (Minimum 220 RPM's) to Rotate Back Reamer Sufficiently to Mix Soil, AC Pipe, & Drill Fluid Into a Slurry While Reamer and New Product Pipe are Simultaneously Pulled Back Through Existing AC Pipe
7. The Pull Head with New Product Pipe Pushes or Squeegees Slurry (Consisting of AC Pipe, Soil, & Drill Fluid) Forward in to the Excavations or Relief Holes
8. Slurry is Removed from Excavations or Relief Holes by Vacuum Excavation (Sucked in to a Container Truck) and Disposed of at Permitted Landfill

    a. Properly, complete Waste Shipment Record (WSR) prior to transporting
    b. Container Truck Must Be Properly Cleaned at Landfill
9. Connect or Tie-in New Pipe to Existing Pipe In Excavations
10. Backfill and Restore Excavations

Allow no Visible Emission during the Close Tolerance Pipe Slurrification (CTPS) process. Low pressure sprayers with amended water should be set up at each excavation to control potential emissions during the CTPS process.

Summary of Construction Activities

1. Push Drill Stem/Rod Through AC Pipe from One Excavation to the Other excavation
2. The Drill Stem/Rod is Attached to the Reaming Train
3. A cable is used to connect the Reamer to the New Product Pipe that will be pulled into the tight-fitting void created by the reamer cutting away the existing AC pipe and soil.
4. Mix Bentonite- Based Fluid to be Used for Pipe Slurrification
5. Bentonite-Based Drill Fluid is Pumped Through the Drill Stem/Rod to the Reamer for Wet Cutting
6. The Drill Stem/Rod is Rotated with Sufficient Force (Minimum 220 RPM's) to Rotate Back Reamer Sufficiently to Mix Soil, AC Pipe, & Drill Fluid Into a Slurry While Reamer and New Product Pipe are Simultaneously Pulled Back Through Existing AC Pipe
7. The Pull Head with New Product Pipe Pushes or Squeegees Slurry (Consisting of AC Pipe, Soil, & Drill Fluid) Forward in to the Excavations or Relief Holes
8. Slurry is Removed from Excavations or Relief Holes by Vacuum Excavation (Sucked in to a Container Truck) and Disposed of at Permitted Landfill
9. Connect or Tie-in New Pipe to Existing Pipe In Excavations
10. Backfill and Restore Excavations